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INTRODUCTION

This report presents interim results of comparisons of carcass characteristics among crossbred cattle sired by bulls from four exotic breeds. The animals were produced in Agriculture Canada's ongoing project to evaluate foreign breeds of cattle. The project was begun in 1968 with the breeding of 10 different types of hybrid females. Details of the experimental design are given in Agric. Can. Publ. 1537, issued in 1974.

The hybrid females, comprising 1150 head, were allocated to two locations, one typical of extensive range conditions (Manyberries, Alta.) and the other typical of intensive farm-type management (Brandon, Man.).

Beefmaster and Red Angus bulls sired the first calves produced by the hybrid heifers in 1972, 1973, and 1974. Results from this phase of the program are presented in Agric. Can. Publ. 1633, published in 1977.

Second and subsequent calves were by Charolais, Simmental, Limousin, and Chianina sires, with the mating plan designed to produce three-way crosses only. Six different sires from each breed were used each year. Progeny produced by the Brandon herd were fed and evaluated at that location. Those produced at Manyberries were fed and evaluated at Lacombe. Evaluation of the performance of those calves born between 1973 and 1976–1977, from birth to time of slaughter, is reported in Agric. Can. Publ. 1682, published in 1979.

Full evaluation of these progeny will not be completed, however, until 1980, and the material presented here and in publication 1682 represents only an interim summary of results. The carcass data presented here were obtained from 2092 animals born between 1973 and 1976. Data for the last 205 animals slaughtered from the Lacombe station are excluded here because practical difficulties precluded obtaining their individual liveweights at the packing plant. However, these data will be included in the final report. Weight and degree of finish (potential carcass grade) were the chief criteria of readiness for market.

Average slaughter age was 427 days at Brandon and 447 days at Lacombe. At slaughter, hide, kidney fat, and carcass weight were recorded for each animal, quarter weights were taken after separation between the 11th and 12th rib, and average fat cover and area of the longissimus dorsi (rib eye) were evaluated from this cross section. Subsequently, the carcasses were divided into commercial cuts, namely chuck, rib, shank, plate, brisket, round, long loin, and flank. Long loin, comprising the short loin and sirloin butt, and the round were separated into fat, lean, and bone.

Data analyses employed statistical adjustments for sex, breed cross of dam, and year of birth of calf.

LOCATION DIFFERENCES

Carcasses from animals fed at Brandon averaged 7 kg heavier than those from Lacombe, had approximately 33% greater fat cover, and averaged 2.9% larger in rib eye area (Table 1). The cattle at Brandon had a lower percentage of hide and a higher percentage of kidney fat, with the combination of these differences resulting in a dressing percentage 1% greater than was obtained for the cattle fed at Lacombe. Greater bone content and less yield of lean were also recorded for the Brandon cattle. The lower yield of lean is consistent with the higher average fat cover found in carcasses from Brandon.

Location differences in proportions of bone and lean in the loin and round were statistically significant, indicating some differences in carcass-breaking procedures between the two stations (Table 2).

SEX DIFFERENCES

Carcass weight of males at Brandon exceeded that of females by 44.5 kg, almost double the sex difference at Lacombe. Rib eye area was greater for males than females, and the sex difference again was substantially larger at Brandon. Hide and kidney fat, expressed as percentages of liveweight, were less for males at both locations and dressing out percentage was higher for males at Brandon. Bone content of the round and long loin, expressed as a percentage of the untrimmed weight of these cuts, was greater for males than females, but sexes did not differ appreciably in the proportion of lean in these cuts or in average fat cover (Table 1).

The proportion of rib, loin, and round, expressed as a percentage of the chilled carcass weight, was greater for females than for males, the differences being in agreement at the two locations (Table 2).

BREED OF SIRE DIFFERENCES

Carcass weight was substantially lower for progeny of Limousin sires than for progeny sired by any of the other three breeds (Table 3). The lower carcass weight reflected slower growth among the Limousin progeny because all breeds were slaughtered at approximately the same age. Differences in average rib fat among breeds of sire were small, with Chianina sires tending to produce the least rib fat. Chianina sires produced the largest and Simmental sires the smallest rib eye areas. Limousin sires had the highest rib eye area per 100 kg carcass weight at both locations, but the other three breeds of sire differed little in this respect.

Progeny groups were identical in the relative proportion of forequarter to hindquarter but differed in yield of individual primal cuts. Chianina progeny had the highest proportions of chuck, shank, and round and the lowest proportions of rib, brisket, plate, and flank. Limousin progeny had the greatest percentage of loin and the smallest percentage of shank. Breed rankings were similar at the two locations but many of the differences were not statistically significant (Table 4). Viewed in terms of the total proportion of high-priced cuts (rib, long loin, and round), the Chianina sires ranked first at Brandon and the Limousin sires ranked first at Lacombe but the maximum difference between breeds of sire was less than 1%.

Dressing percentage was greatest for the Limousin progeny, with the Simmental averaging lower than the other groups (Table 5). This breed difference was associated with differences in weight of hide in which the Simmental was heaviest and the Limousin lightest of the breeds. Differences also occurred in weight of kidney fat, which was greatest for Simmental progeny and least for Chianina. The percentage of bone in round and long loin was substantially lower for Limousin progeny and higher for Chianina progeny than for the other groups. Limousin progeny ranked first for proportion of lean. Chianina progeny ranked second, and Simmental progeny had the lowest values. The difference between Simmental progeny and Limousin progeny was 1.28% at Brandon and 1.23% at Lacombe.

SUMMARY

Preliminary comparisons of carcass performance traits were made among four exotic breeds used as terminal sires. Results are based on evaluation of 2092 carcasses. Two test locations were involved, Brandon and Lacombe, but apart from a difference in average age of slaughter (427 vs. 447 days), the evaluation procedures were comparable. Ranking of the sire breeds for all carcass characteristics were similar at the two locations.

Carcass weight of Limousin progeny averaged 5–6% lighter than that of the other progeny groups. However, dissection of the round and long loin established that Limousin carcasses had less bone and more lean than carcasses from the other groups. Chianina carcasses had the most bone but they also had a high proportion of the high-priced primal cuts, namely the rib, long loin, and round, and ranked second to the Limousin in dressing percentage and carcass lean content. Carcasses from Simmental and Charolais progeny were similar in most traits, but the Simmental carcasses had smaller rib eye areas, heavier hides (with a corresponding reduction in dressing percentage), and slightly lower proportion of lean in the long loin and round.

Final comparisons among progeny born to dams from the 10 breed crosses produced for this project will be reported when data are complete.

Table 1. Carcass traits (average ± standard error) and number of carcasses evaluated, by sex and location

Carcass trait	Brandon						Lacombe					
	Steers		Heifers		Av		Steers		Heifers		Av	
Basic traits												
Hot carcass weight (kg)	293.1 ± 1.3		248.6 ± 1.4		270.8 ± 1.0		275.6 ± 1.3		251.7 ± 1.4		263.6 ± 1.0	
Average rib fat (cm)	1.54 ± 0.02		1.48 ± 0.02		1.51 ± 0.02		1.04 ± 0.01		1.08 ± 0.02		1.06 ± 0.01	
Rib eye area (cm^2)	82.49 ± 0.40		75.89 ± 0.43		79.19 ± 0.31		77.44 ± 0.46		76.48 ± 0.51		76.96 ± 0.38	
Traits expressed as proportions												
Hide (% liveweight)	6.95 ± 0.03		7.22 ± 0.03		7.08 ± 0.02		7.59 ± 0.03		7.98 ± 0.03		7.78 ± 0.03	
Kidney fat (% liveweight)	1.93 ± 0.02		2.18 ± 0.02		2.05 ± 0.02		1.76 ± 0.02		1.93 ± 0.03		1.85 ± 0.02	
Hot carcass (% liveweight)	61.42 ± 0.08		60.77 ± 0.08		61.10 ± 0.06		60.24 ± 0.08		59.98 ± 0.09		60.11 ± 0.07	
Bone (% long loin and round, chilled)	18.16 ± 0.05		17.52 ± 0.05		17.84 ± 0.04		17.46 ± 0.06		16.55 ± 0.07		17.00 ± 0.05	
Lean (% long loin and round, chilled)	69.14 ± 0.11		69.04 ± 0.11		69.09 ± 0.08		70.16 ± 0.12		70.48 ± 0.13		70.31 ± 0.10	
Number of carcasses	647		575		1222		472		398		870	

Table 2. Proportions of commercial cuts obtained from steers and heifers at Brandon and Lacombe (percentage of chilled carcass weight ± standard error)

Commercial cut	Percentage of carcass weight											
	Brandon						Lacombe					
	Steers		Heifers		Av		Steers		Heifers		Av	
Chuck	26.64	± 0.03	26.12	± 0.03	26.38	± 0.02	26.13	± 0.05	25.56	± 0.06	25.85	± 0.04
Rib	9.46	± 0.02	9.82	± 0.02	9.64	± 0.02	9.80	± 0.04	10.12	± 0.04	9.96	± 0.03
Shank	4.01	± 0.01	3.80	± 0.01	3.91	± 0.01	3.79	± 0.02	3.51	± 0.02	3.65	± 0.02
Plate	8.50	± 0.03	8.64	± 0.03	8.57	± 0.02	8.28	± 0.04	8.22	± 0.04	8.25	± 0.03
Brisket	3.20	± 0.02	3.18	± 0.02	3.19	± 0.01	2.92	± 0.02	2.96	± 0.03	2.94	± 0.02
Round	25.59	± 0.05	25.71	± 0.05	25.65	± 0.04	25.81	± 0.05	25.74	± 0.06	25.78	± 0.04
Long loin	16.41	± 0.03	16.90	± 0.03	16.66	± 0.02	17.70	± 0.04	18.47	± 0.05	18.08	± 0.04
Flank	6.20	± 0.03	5.94	± 0.03	6.06	± 0.02	5.31	± 0.03	5.19	± 0.04	5.25	± 0.03
Rib, loin, and round	51.46		52.43		51.95		53.31		54.33		53.82	

Table 3. Basic carcass traits for progeny from four breeds of sire, at Brandon and Lacombe (average ± standard error), with breeds ranked from highest to lowest for each trait at each location and the approximate difference for statistical significance shown

Basic carcass trait and location	Average ± standard error				Ranking of breeds of sire[1]				Approximate difference required for statistical significance at $P < 0.05$
	Charolais-sired	Simmental-sired	Limousin-sired	Chianina-sired	1	2	3	4	
Hot carcass weight (kg)									
Brandon	275.7 ± 2.0	271.0 ± 2.0	257.8 ± 1.9	278.8 ± 1.6	C	Ch	S	L	5.6
Lacombe	266.7 ± 2.0	260.7 ± 1.9	253.4 ± 1.9	273.7 ± 1.6	C	Ch	S	L	5.6
Average rib fat (cm)									
Brandon	1.48 ± 0.03	1.57 ± 0.03	1.55 ± 0.03	1.44 ± 0.02	S	L	Ch	C	0.08
Lacombe	1.03 ± 0.02	1.06 ± 0.02	1.11 ± 0.02	1.02 ± 0.02	L	S	Ch	C	0.06
Rib eye area (cm^2)									
Brandon	79.22 ± 0.63	77.25 ± 0.62	79.00 ± 0.58	81.29 ± 0.49	C	Ch	L	S	1.78
Lacombe	76.98 ± 0.72	75.00 ± 0.69	77.65 ± 0.68	78.21 ± 0.57	C	L	Ch	S	2.03
Rib eye area / 100 kg carcass weight (cm^2/100 kg)									
Brandon	28.7	28.5	30.6	29.2	L	C	Ch	S	
Lacombe	28.9	28.6	30.6	28.6	L	Ch	S	C	

[1]C, Chianina; Ch, Charolais; S, Simmental; L, Limousin.

Table 4. Proportions of commercial cuts (as percentage of chilled carcass weight ± standard error) for progeny from four breeds of sire, with breeds ranked from highest to lowest for each cut at both locations and the approximate difference for statistical significance shown

	Percentage of carcass weight				Ranking of breeds of sire[1]				Approximate difference required for statistical significance at $P < 0.05$
	Charolais-sired	Simmental-sired	Limousin-sired	Chianina-sired	1	2	3	4	
Chuck									
Brandon	26.28 ± 0.05	26.44 ± 0.05	26.32 ± 0.05	26.48 ± 0.04	C	S	L	Ch	0.14
Lacombe	25.61 ± 0.08	25.88 ± 0.07	25.80 ± 0.07	26.10 ± 0.06	C	S	L	Ch	0.23
Rib									
Brandon	9.68 ± 0.04	9.60 ± 0.04	9.81 ± 0.03	9.47 ± 0.03	L	Ch	S	C	0.11
Lacombe	10.12 ± 0.06	9.85 ± 0.05	10.03 ± 0.05	9.82 ± 0.04	Ch	L	S	C	0.17
Shank									
Brandon	3.87 ± 0.02	3.88 ± 0.02	3.78 ± 0.02	4.10 ± 0.01	C	S	Ch	L	0.06
Lacombe	3.63 ± 0.03	3.61 ± 0.03	3.54 ± 0.03	3.82 ± 0.02	C	Ch	S	L	0.08
Plate									
Brandon	8.71 ± 0.04	8.71 ± 0.04	8.57 ± 0.04	8.29 ± 0.03	Ch	S	L	C	0.11
Lacombe	8.40 ± 0.06	8.38 ± 0.06	8.22 ± 0.06	8.01 ± 0.05	Ch	S	L	C	0.17
Brisket									
Brandon	3.23 ± 0.03	3.34 ± 0.03	3.14 ± 0.02	3.06 ± 0.02	S	Ch	L	C	0.08
Lacombe	2.92 ± 0.04	3.02 ± 0.04	2.96 ± 0.04	2.84 ± 0.03	S	L	Ch	C	0.11
Round									
Brandon	25.54 ± 0.08	25.30 ± 0.08	25.46 ± 0.07	26.29 ± 0.06	C	Ch	L	S	0.23
Lacombe	25.72 ± 0.08	25.58 ± 0.08	25.68 ± 0.08	26.12 ± 0.06	C	Ch	L	S	0.23
Long loin									
Brandon	16.58 ± 0.04	16.54 ± 0.04	16.94 ± 0.04	16.56 ± 0.03	L	Ch	C	S	0.11
Lacombe	18.03 ± 0.08	18.08 ± 0.06	18.32 ± 0.06	17.90 ± 0.05	L	S	Ch	C	0.23
Flank									
Brandon	6.20 ± 0.05	6.22 ± 0.05	6.05 ± 0.04	5.80 ± 0.04	S	Ch	L	C	0.14
Lacombe	5.32 ± 0.05	5.38 ± 0.05	5.21 ± 0.05	5.09 ± 0.04	S	Ch	L	C	0.14
Rib, loin, and round									
Brandon	51.80	51.44	52.21	52.32	C	L	Ch	S	
Lacombe	53.87	53.51	54.03	53.84	L	C	Ch	S	

[1] C,Chianina; S, Simmental; L, Limousin; Ch, Charolais.

Table 5. Carcass traits expressed as proportions (averages ± standard error) for progeny from four breeds of sire, with breeds ranked from highest to lowest for each trait at each location and the approximate difference for statistical significance shown

Carcass trait expressed as a proportion, and location	Average ± standard error				Breeds of sire ranking[1]				Approximate minimum difference required for statistical significance at $P < 0.05$
	Charolais-sired	Simmental-sired	Limousin-sired	Chianina-sired	1	2	3	4	
Hide (% liveweight)									
Brandon	6.92 ± 0.04	7.45 ± 0.04	6.92 ± 0.04	7.04 ± 0.03	S	C	Ch	L	0.11
Lacombe	7.71 ± 0.05	8.13 ± 0.05	7.53 ± 0.05	7.75 ± 0.04	S	C	Ch	L	0.14
Kidney fat (% liveweight)									
Brandon	2.04 ± 0.03	2.23 ± 0.03	2.05 ± 0.03	1.90 ± 0.02	S	L	Ch	C	0.08
Lacombe	1.78 ± 0.04	1.97 ± 0.04	1.89 ± 0.04	1.75 ± 0.03	S	L	Ch	C	0.11
Hot carcass (% liveweight)									
Brandon	60.68 ± 0.12	60.36 ± 0.12	61.75 ± 0.11	61.61 ± 0.10	L	C	Ch	S	0.34
Lacombe	59.90 ± 0.13	59.00 ± 0.13	60.86 ± 0.13	60.74 ± 0.10	L	C	Ch	S	0.37
Bone (% long loin and round, chilled)									
Brandon	17.96 ± 0.08	18.06 ± 0.07	17.00 ± 0.07	18.34 ± 0.06	C	S	Ch	L	0.23
Lacombe	17.00 ± 0.10	17.22 ± 0.09	16.31 ± 0.09	17.48 ± 0.08	C	S	Ch	L	0.28
Lean (% long loin and round, chilled)									
Brandon	68.74 ± 0.17	68.36 ± 0.17	69.64 ± 0.16	69.61 ± 0.13	L	C	Ch	S	0.48
Lacombe	70.01 ± 0.19	69.80 ± 0.18	71.03 ± 0.18	70.37 ± 0.15	L	C	Ch	S	0.54

[1] C, Chianina, S, Simmental; L, Limousin; Ch, Charolais.